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APPLICATION OF UNMANNED FLIGHTS FOR PROFESSIONAL ACTIVATION OF PEOPLE WITH DISABILITIES IN THE CONTEXT OF NATIONAL AND EUROPEAN LAW

Resume

The issue of professional activity of people with disabilities (PWD, PD, PWDs) is important from the point of view of individuals as well as of the whole society and economy. There are various, complementary to each other methods of supporting the disabled in this regard. This article presents the possibility of using unmanned flight technology for this purpose. The needs of people with disabilities were analyzed and juxtaposed with current and future technological possibilities taking into account national and European legal conditions.

Keywords: disability, professional activation, drones, unmanned flights, UAV

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The subject of this article is professional activation of people with disabilities. This article presents the possibilities of using unmanned flight technology for this purpose. The aim of this article is to analyze the scope of possible applications of unmanned flights for the professional activation of people with disabilities. This is a relatively new and very dynamically developing technology that can be a chance to improve the livelihood of this group of people. This requires the following four conditions to be met: emergence of aspirations to acquire professional qualifications among people with disabilities, interest of decision-makers in the use of unmanned flight technology for this purpose, establishing appropriate legal regulations and popularization of knowledge in this area.

Drones can become a systemic element of professional activation if people with disabilities in Poland are open to acquiring new professional qualifications and are not afraid to use unmanned flight technology. In order to explore such a research question, the answers from the survey conducted among 31x people will be analyzed. The questions addressed to the respondents were aimed at operationalizing the study. The questions were used by the author to operationalize the following scale of measuring openness to professional activation. The lowest level is Grade 1, in the study referred to as 'I'm afraid/I'm not afraid.' Grade 2 – this is 'I accept', the next degree is 'I am open to professional activation, I see drones as an opportunity'. Grade 4 is 'readiness to participate in training' and the last step 5 is 'recognizing the need for changes in legal regulations in the field of drone operation'.

This study will verify the hypothesis that the use of unmanned flights may become one of the elements of the process of professional activation of people with disabilities, provided that aspirations to acquire professional qualifications among them appear, and decision-makers achieve a degree of interest in the subject to the extent that expresses the will to modify national legislation in such a way to enable the operation of drones by people with disabilities. The study will be carried out using methods of literature analysis and criticism together with a heuristic method, in order to combine possible applications of unmanned flights within one coherent system of professional activation.

Disability is a term used to describe various types of dysfunctions in a person's life. This category encompasses a whole spectrum of phenomena, which in simple terms can be divided into two subgroups – legally sanctioned (legal disability) and declarative (biological disability) (Sijko 2010). Legally mandated disability is a direct result of a medical assessment of an individual, although specific rules of qualification

differ in different legal systems and legal consequences of having such a certificate also differ.

Biological disability is not documented and is based on a person's declared physical and mental condition that does not allow him or her to function normally in society and carry out daily activities (Sijko 2010). This often leads to social and economic exclusion of PWD (varying in degree and nature, depending on the type and degree of disability and external factors such as material condition, family situation, etc.). However, there are methods of social and professional activation of this group. This makes it possible to include at least some of PWD in the labor market, and as a result, to enable them to support themselves, thus relieving the state budget (less social support is needed). There are also therapeutic and psychological benefits such as e.g. an increase in self-esteem. However, there is no one-size-fits-all method of activation. In different countries it is implemented in different ways (both at the state and non-governmental level).

Unmanned flights

The term "drone" has entered colloquial language for good and is widely understood. However, it is worth considering how unmanned flights were understood until recently. Already in antiquity people created objects that could float in the air without any crew. The Chinese used lanterns and balloons in their rituals, as well as a means of transmitting signals from a distance. The first attempt to use unmanned objects in a controlled manner took place in 1849 during the Austrian attack on Venice. Balloons with bombs were released from the ships towards a nearby town. The time of explosion was controlled, but in most cases, balloons missed the target due to the wind. Still, the military potential of this technology was noticed. In 1917, the first flight of an automatic Hewitt-Sperry plane took place, detonating the bomb at a set distance from take-off (Keane 2013). It was one of the planned ways of the US fight against German submarines. Before the Second World War, the technology of unmanned flights was developed in the military area, especially if it comes to the possible types of autopilots. In 1939, the Radioplane O.Q.2 was tested - the first unmanned aircraft to enter mass production. Since then, this technology has developed in the US, Europe and the Soviet Union in the form of exercise planes, reconnaissance aircraft and explosive-carrying aircraft (Custers 2016).

It was only around 2010 that drones began to become more popular and more available for civilian applications. In 2013, the Chinese company

DJI released its first drone, the Phantom (Hongjia 2017). Currently, this company controls over 85% of the global drone market, and only in the USA there are 2 million such civilian devices registered. For now, annual sales increases of 40 to 50% are observed, which shows how dynamic the market is. This brief history outline shows that civil applications were indeed introduced quite recently. It is important to point out that the legislative processes do not keep up with the rapidly developing market. Initially, the issue was disregarded and the same regulations were applied as for passenger flights (Chicago Convention 1944, Art. 8) Once the work on regulating this area started, the draft legal regulations were based on the currently existing technologies and the scale of operation. For this reason, the draft regulations become obsolete even before they enter into force.

There are 4 basic terms describing unmanned flights. UAV stands for Unmanned Aerial Vehicle. Together with the flight control station and the communication channel, it forms the UAS, i.e. the unmanned aerial system. RPA is a special type of UAV because it is remotely piloted. There are also drones that are able to fly without a pilot, autonomously or semi-autonomously, with the pilot making only selected decisions. RPAS is a concept similar to UAS, i.e. RPA associated with a flight control station and communication channel (Clarke 2013).

Professional activation of people with disabilities

What is the most effective way to support people with disabilities in the labor market? To answer this question, it is worth analyzing what problems people trying to find a job face, especially when they do it for the first time. In developed countries, the labor market is changing. Every year there are fewer and fewer professions requiring manual work, the share of intellectual workers with a computer being the main work tool is growing. The COVID-19 pandemic has additionally popularized the practice of remote work in many companies. In theory, this should make it easier for people with disabilities to access the labor market, as in many cases physical disability will not be a big constraint in such circumstances. Moreover, in recent decades there have been strong social movements in support of tolerance, diversity and the fight against social exclusion. This trend should also contribute to easier access of the disabled to the labor market, from the socio-psychological perspective (Babik and Gardner 2021).

One of the socio-economic trends is the concept of corporate social responsibility (CSR). This responsibility is expressed, inter alia, through

various social actions linking the business world with the world of people with disabilities. There is a lot of room for change. The economic activity rate among people with disabilities in the economic working age in Poland is 28.3%. In absolute terms, this means over 1.1 million people with disabilities outside labor market. The same factor for non-disabled people is 80.5% (Polish Central Statistical Office 2018).

The question arises: what should professional activation of people with disabilities look like and what role may individual institutions play in this process? Two approaches to this topic can be distinguished, which are not necessarily mutually exclusive (Vaziri et al. 2014). The first approach is to stimulate employers financially and legally to be more willing to employ people with disabilities. This requires allocation of a specific budget for this purpose and a very conscious determination of the rules of aid and legal provisions regulating these aspects in order to avoid abuses. The second approach is to popularize self-employment and remove barriers within this area. Activities in this dimension do not have to focus solely on people with disabilities, who will still benefit from changes in regulations that streamline the process of setting up one's own business, running it and accounting for it. Of course, it is also possible to financially support people with disabilities who choose this form of employment, e.g. in Poland, subsidies are paid by PFRON.

The system of professional activation of people with disabilities in Poland

The situation of people with disabilities in social life is improving every year. Their average levels of education are increasing, the rates of acceptance of the disabled in society are improving, and more and more public facilities are becoming accessible. At the same time, however, professional activity remains relatively low. The reasons for this are mental, psychological and legal barriers (Kuźmiuk 2022). Mental barriers are negative reactions from the environment, such as indifference, discrimination, conscious or subconscious aversion, or even the "fear of the other"- fearing those who are different. Psychological barriers of a disabled person are potential problems with self-esteem, self-confidence and motivation to change their current life, to enter "unknown waters". Legal barriers include excessive and over-detailed instructions and legal restrictions that discourage people with disabilities from activating. It should be admitted that people with disabilities often face additional difficulties in working with official functions, for example due to the fact that buildings are not adapted to their capacity to reach a specific

place. Each of the professionally inactive disabled people has their own combination of reasons for not taking up a job, not all of which may be rational, and some of them one can be simply not aware of (Ochonczenko 2008).

Actions for the professional activation should be undertaken at the stage of early education (Rutkowska et al. 2008). They are related to building a child's self-esteem and create a space for them that stimulates decision-making and does not reject such a child because of their difference. What is important at a later stage of development is seeking career development and vocational trainings combined with special courses dedicated to people with disabilities. If such a person achieves favorable conditions to start work in young age and enters the labor market then, the possible support for him or her is much easier than for people who have never taken up a job.

The Polish model of professional support for people with disabilities, developed in the nineties, consists of four stages: occupational therapy workshops, work in establishments for professional activity, work in sheltered workshops and entry into the open labor market. The last stage may be implemented as supported employment (the employer receives benefits related to the employment of a disabled person) or free employment, on the same terms as non-disabled people. This model is complemented by the activities of non-governmental organizations, which deal with, for example, organizing trainings and improving qualifications, promoting employment of disabled people and career counseling. Despite the various forms of Supported Employment, it happens that employers prefer to pay a fine rather than hire people with disabilities. This situation is influenced, on one hand, by the attitude of employers, and, on the other hand, by very high labor costs. Employers are also afraid of obligations arising from the employment of disabled people and the instability of legal regulations in this area (Trzyna 2009). On the one hand, there is a framework of the system, which is meant to provide support to people with disabilities at various stages of their professional path. On the other hand, it is not possible without the involvement of employers and the activation of as many people with disabilities as possible and encouraging them to act on their own initiative, showing them the benefits of taking up a job. Any way to initiate such activities is good, so all available methods should be involved, with particular emphasis on the benefits of modern technologies.

Drones as an opportunity for people with disabilities

Few people are aware that drones have a great potential in the area of activating people with disabilities. Vast majority of physically disabled people can have the ability to fly a drone, just like a non-disabled person. By undertaking this activity, disabled people will get a chance to open up to the world, experience the feeling of flying, speed, and socialization with other able-bodied and disabled people. Even ignoring the economic level, drones can be considered one of the forms of rehabilitation. In general, however, nothing prevents the disabled people from joining the labor market as drone operators. Unmanned aerial vehicles are a rapidly developing field and the demand for operators is high - in the US, the demand for one hundred thousand drone operators by 2025 is estimated. Depending on the type and degree of disability, it may be necessary to adapt the remote-control station to the capabilities of a specific pilot. However, these are relatively inexpensive adjustments - e.g. an appropriate joystick. There are also more advanced technologies, such as e.g. Thought Control, Emotive Kit.

In 2016 the French charity organization LADAPT in cooperation with the Kindai company implemented the Handi Drone project, in which drones were adapted to the people's with disabilities needs and demonstration flights were carried out for them (Fouache 2016). The Handi Drone example shows that people with disabilities can be drone operators. In some cases, ships may require some adjustments, but these do not have to be very costly and complex. However, there are also some less obvious benefits that unmanned aerial vehicle technology can provide to people with disabilities. In literature, they are referred to as Assistive Drone Technology (drones as assisting technology), i.e. applications that make it easier for people with disabilities to function in everyday life, without them actively using drones (Fall 2018).

An interesting example is the digital mapping of buildings, e.g. in university campuses. The drone can be programmed in such a way that it will automatically cover a specific route and save a three-dimensional image of the spaces that it visited. The drone can even automatically respond to unexpected obstacles and dynamically adjust the route of its flight. Flights can be made cyclically, thanks to which the information is up-to-date. Such a three-dimensional map can be used by people in wheelchairs. Thanks to this, they are able to locate the desired point on the map and set a route where they will not encounter barriers. If a section is temporarily closed or there are new amenities, the map will be updated on a regular basis. In the case of large complexes without automation,

achieving this effect would not be possible. Such a plan would also be useful for the blind and visually impaired, who, thanks to appropriate voice messages, could navigate through such objects more easily. Of course, this application does not only benefit people with disabilities, it can be used, for example, for regular building inspections. The idea sounds a little abstract, but there are already companies that offer such simplified services, e.g. Industrial Skyworks.

The drone can also be used as a "guide drone" for the blind and visually impaired. Attempts have already been made to use technology for this purpose, for example for blind runners (Zayer et al. 2016). The literature also analyzes the reaction of the environment and the acceptance for such use of this technology (Soto et al. 2018). The respondents mostly declare curiosity and a positive attitude, which shows that this technology has a chance to be quickly popularized. A prototype of such a device has been prepared at the University of Nevada, but at the moment the regulations do not allow its use by a blind person.

It can be assumed that other applications for drones will emerge with the development of this technology. Walking dogs can be an example of such somewhat futuristic uses. This seemingly simple activity can be a really big challenge for a person in a wheelchair. The use of a drone for this purpose, however, raises doubts as to whether such a situation is safe enough for both the dog and bystanders. In practice, this application will probably not become a reality, but it shows a certain direction in which improvements in daily activities are aimed, which can be particularly helpful for people with disabilities.

Legal framework

At the international level, unmanned flights are regulated by the ICAO Convention on International Civil Aviation, the so-called Chicago Convention. The Convention itself does not deal with the issue of the possibility for disabled people to perform as unmanned flight operators. On December 31, 2020, in all European Union countries, in place of individual national regulations, uniform regulations on unmanned flights became applicable - Commission Implementing Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aerial vehicles, delayed due to the COVID-19 pandemic (on under Commission Implementing Regulation (EU) 2020/746), with certain transition periods. The regulation introduces a new categorization of unmanned flights, based on the overflow risk assessment. The lowest category, open, applies to flights weighing up to 25 kg to a maximum height of 120 m and

always in sight, without carrying hazardous materials and without flying over crowds. Depending on the weight of the ship, three sub-categories are distinguished (A1 - up to 900 g, A2 - up to 4 kg, A3 - up to 25 kg) each with different requirements for operator qualifications. The special category of unmanned operations (B) already requires permission to fly, obtained from the national air traffic management institution (in Poland, the Civil Aviation Authority) based on the risk analysis performed.

The highest category, certified (C), concerns specialized flights with the use of certified equipment and personnel (The European Commission 2019).

People who want to fly drones with a take-off weight over 250g in the open category must undergo an on-line training and pass an on-line 40- question test at the end of the training. For subcategory A2, it is also necessary to obtain a certificate of unmanned aerial vehicle pilot competence (practical training in the form of self-study and theoretical exam under supervision). The special category requires additional training in the field of specific types of flights and completion of practical training in a dedicated entity. The regulation does not say much about whether disabled people have equal access to operator certification. The only condition was that the drone operator "may not perform his duties under the influence of psychoactive substances or alcohol or in a situation where he is unable to perform his tasks due to injury, fatigue, medication, illness or other reasons". From this provision it can be concluded that if a person is fit to fly despite illness, then such a flight may be performed.

Before 2021, certification of operators for sports and recreational flights with drones weighing less than 150 g, within the range of visual visibility, was not required in Poland. If these conditions were not met, it was necessary to obtain a UAVO qualification certificate. One of its elements is having a valid aeronautical medical certificate that there are no contraindications to perform the function of a member of the air crew. Interestingly, with the fee for the exam itself, there was a discount for disabled people, which would indicate that they were allowed to use unmanned aerial vehicles. Ultimately, however, the decision on the admittance of a given person was made by a medical examiner, incl. on the basis of the regulation listing the contraindications for being aviation personnel. Currently, UAVO qualification certificates are converted to new types of certifications (A1 + A3 / A2 / B). This means that medical examinations will no longer apply to operators from 2021, which would mean a significant change from the point of view of people with disabilities.

Exploring the potential of unmanned flights as a new profession among people with disabilities

In order to examine the potential of unmanned flights among people with disabilities, a survey was conducted among 31 respondents from different age groups, with a predominance of people with higher education. The results clearly show interest in the topic among different groups in the population, including 22.6% of those affected by exclusion. Most of the respondents are familiar with the concept of an unmanned ship or drone, and 25.8% have flown one. Although only 5 respondents are qualified to fly a drone, as much as 90.3% see them as one of the new forms of occupation for people with disabilities. The respondents indicated many possibilities for drone use, such as aerial photography, terrain mapping (including 3D), mobility assistance for the blind, medical transport (medicines, blood), delivery of small parcels, area or animal surveillance (monitoring), among many others.

The general perception of safety among the respondents is that under certain conditions, such as special adaptation of the drone or assistance of a second operator, PWD would be able to safely operate an unmanned aerial vehicle without harming their surroundings. However, there are also extreme opinions in this regard, including a complete ban on the use of drones by people with disabilities for fear of their safety and that of those around them. Many people have pointed out various disabilities that can make piloting difficult or impossible. Prominent among such impairments were mental retardation and mental illness, as well as impaired motor coordination and significant limitations in upper limb movement.

Most of the respondents suggested ways to address the potential risks. Examples of these include adapting the control system for specific disabilities, optimizing artificial intelligence and improving the emergency landing system, and more rigorous practical testing. Most of the suggestions were related to assistance or control of a second operator.

The results of the survey indicated that it is worth developing this branch as a potential job market for people with disabilities. Most of the limitations can be overcome at relatively low cost and the payoff, both for those involved and for society, can be significant, although it is of course important to realize that not everyone has the right predispositions.

Proposed actions aimed at including unmanned flights in the model of professional support for people with disabilities

A number of conditions would have to be met for drones to become an effective tool for professional activation. First, the assumptions for further analysis need to be defined:

- the supply and availability of devices is not falling
- the demand for drone-related services is steadily increasing
- new areas where drones are used are gradually emerging
- the legal framework is left to the discretion of the EU, implemented in national legislation
- people with disabilities need clear incentives and a straightforward job path (any handicap will put many people off)
- the described model is complementary to the existing support system and does not replace any of its elements
- the activities presented are not only directed at people with disabilities. Unmanned aviation is a rapidly developing and unsatisfied sector of the economy with many potential jobs. This means less competition for a given place, and thus greater opportunities for the disabled (difficulties in competing with non-disabled people were indicated in the earlier part of the work)
- people with disabilities prefer employment with an employer to self-employment (it is, among others, easier, faster, more reliable).

Taking the above mentioned assumptions into account, the activities can be grouped according to the goals to be achieved for the initiative to be effective. They will be:

- creating many jobs for drone operators,
- creating conditions for the work of people with disabilities,
- encouraging disabled people to work there,
- active support in the certification and training process.

Jobs for drone operators exist and there is a growing number of them. Still, this market can be stimulated by fiscal incentives, subsidies to aircraft, etc. From the point of view of the disabled people, it is worth to look at the concept of "disabled cooperatives", which is almost in decline now. Establishing a cooperative of this type, in which operators could register and carry out orders on common equipment, would be simpler in terms of employment, cheaper in terms of equipment, but also attractive for clients who would have a reliable provider of services (e.g. wedding filming).

Creating working conditions means all kinds of adapting devices.

As already mentioned, this market is developing dynamically and the costs of adaptation does not need to be high, especially if they were to be shared. It is worth emphasizing that different types of disability may require different adjustments.

Encouraging people with disabilities can be divided into two phases- creating an interest in the topic and deepening the knowledge. Creating interest should start with a leaflet or a very short brochure, combined with a short video spot. By using, among others, social media and relations between people with disabilities a large audience could be reached quite quickly. Interested people should have a chance to see what the operator's work looks like thanks to e.g. practical workshops. If someone finds it as an interesting and stimulating activity, and sees it as more valuable than sitting at home, it can be a strong motivation.

People who decide to take up such work should be taken care of by a dedicated institution (it might be a part of the "unmanned flight cooperative"), whose task is to prepare such a person to be a full-fledged employee - to provide assistance in the certification process, training in aviation safety and piloting unmanned aircraft etc. Such a person then becomes a full-fledged operator and may enter the labor market on favorable terms.

CONCLUSION

Drones have become available for civilian flight only recently. Until now it has been a technology used exclusively by the military, but over the last few years it has been rapidly popularized for sports and recreational and commercial applications. Aviation regulations are characterized by high complexity. As a result, dedicated legislation regulating the area of unmanned flights at the European Union level is only in the process of implementation. In the meantime, different regulations in individual national legal systems were created, not always consistent with each other. This introduces additional complications when trying to standardize this law at the international level.

At the same time, however, drones bring new opportunities for professional activation of PWD. As mentioned earlier, drone operators are in high demand, with few specialists on the market. This means attractive working conditions and opportunities for people with disabilities, if they were only able to obtain the required qualifications and meet the conditions of physical and mental fitness. At least in theory, full physical fitness is not necessary to be a drone operator.

In addition to professional activation, drones also have the potential for improvements in everyday life. Further applications are likely to emerge gradually, but their use depends on whether the law allows these new, hitherto unknown activities.

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ПРИМЕНА БЕСПИЛОТНОГ ЛЕТЕЊА ЗА ПРОФЕСИОНАЛНО АКТИВИРАЊЕ ОСОБА СА ИНВАЛИДИТЕТОМ У КОНТЕКСТУ НАЦИОНАЛНОГ И ЕВРОПСКОГ ПРАВА

Сажетак

Питање професионалне делатности особа са инвалидитетом (ОСИ, ПД) је важно како са становишта појединца, тако и целокупног друштва и привреде. Постоје различити, међусобно комплементарни, методи подршке особама са инвалидитетом у том погледу. Овај чланак анализира могућност коришћења беспилотне технологије летења у ове сврхе. Анализиране су потребе особа са инвалидитетом и супротстављене садашњим и будућим технолошким могућностима узимајући у обзир националне и европске правне услове.

Кључне речи: инвалидност, професионална активација, дронови, беспилотни летови, УАВ

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